AMENDMENTS TO THE SPECIFICATION

Please amend page 6, lines 16-26, as follows:

In accordance with still another aspect of the present invention, there is provided a method for binarizing an image, comprising the steps of receiving an ~~image,;~~ image, dividing the received image into blocks, and classifying the divided blocks into character blocks and background blocks, enhancing edges of a character block using relations between neighboring pixels in the character block, and generating a threshold for distinguishing character pixels and background pixels of the character block, and binarizing pixels of the edge-enhanced character blocks into a first brightness value for character pixels and a second brightness value for background pixels by comparing the pixels of the character blocks with the threshold, and binarizing pixels of the classified background blocks into the second brightness value.

Please amend page 9, lines 15-18, as follows:

FIGs. 11A to 11C are ~~diagrams~~ examples of images illustrating a comparison of output characteristics between a quadratic filter and an improved quadratic filter in a binarization device according to an embodiment of the present invention;

Please amend page 10, lines 3 and 4, as follows:

FIGs. 19A to 19I are ~~diagrams~~ examples of images illustrating images generated in each step of the binarization procedure of FIG. 18;

Please amend page 10, lines 8 and 9, as follows:

FIGs. 21A to 21G are ~~diagrams~~ examples of images illustrating images generated in each step of the binarization procedure of FIG. 20.

Please amend page 10, lines 19-24, as follows:

In the embodiments of the present invention, an input image is assumed to have a size of 640×480 pixels. The term "block" refers to character and background blocks, and it is assumed herein that each of the blocks has a size of 8×8 pixels. In addition, the term "grouped block" refers to a block made by grouping a character block to be binarized with its 8 neighboring blocks, and it is assumed herein that the grouped block has a size of 24×24 pixels.

Please amend page 30, lines 3-23, as follows:

As described above, in the first to fourth embodiments of the present invention, the edge enhancement part 130 can be implemented using the quadratic filter of FIG. 8 or the improved quadratic filter of FIG. 10. The edge enhancement part 130 using the improved quadratic filter performs the function of enhancing edges while solving the drawback of a black block surrounding characters of the binarized image that occurs after the character block (or the grouped block containing the character block) is binarized. When the improved quadratic filter is used, the denormalization operation used in the quadratic filter is not performed. Therefore, when the quadratic filter is used, the edge enhancement part 130 denormalizes the quadratic-processed character block (or a grouped block containing the character block), and at the same time, calculates a threshold BTH from the denormalized character block (or the grouped block containing the character block). When the improved quadratic filter is used, however, the edge enhancement part 130 uses the intact quadratic-processed normalized character block (or the grouped block

containing the character block), and calculates the threshold BTH_N by normalizing the first threshold Th1. FIGs. 11A to 11C are ~~diagrams~~ examples of images for making a comparison of output characteristics between the quadratic filter (QF) and the improved quadratic filter (IQF). Specifically, FIG. 11A illustrates an example of an image input to the filter, FIG. 11B illustrates an example of an image after quadratic filtering, and FIG. 11C illustrates an example of an image after improved quadratic filtering.

Please amend page 34, lines 4-19, as follows:

After the threshold Cth is calculated, the operation of classifying the blocks into character blocks and background blocks is performed. For that purpose, a block number BN is initialized to '0' in step 627, and S^k of a block with the block number BN is accessed in step 629. Thereafter, in step 631, the classification part 219 classifies the corresponding block as a character block or a background block by comparing S^k of the block with the threshold Cth. Classification part 219 classifies, in step 633, the k^{th} block as a character block (CB) if $S^k \geq Cth$ ("Yes" path from decision step 631) and classifies in step 635 the k^{th} block as a background block if $S^k < Cth$ as shown in Equation (3) ("No" path from decision step 631). Thereafter, it is determined in step 637 whether the classified block is the last block. If the block #BN is not the last ~~block("No"~~ block ("No" path from decision step 637), the procedure increases the block number by one in step 639, and then returns to step 629 to repeat the above operation. When the above operation is completely performed, the block classification results are output. After the image is divided into the blocks, the divided blocks are classified into character blocks and background blocks.

Please amend page 39, lines 4-28, with a paragraph indentation, as follows:

FIG. 17 is a flowchart illustrating the binarization operation, 413, used in FIGS. 12-15. Referring to FIG. 17, the binarization part 140 determines in step 711 whether a received block is a character block or a background block. If the received block is a character block ("No" path from decision step 711), the binarization part 140 initializes a pixel number PN to '0' in step 713, and then accesses a pixel #PN in step 715. The pixel of the character block is quadratic-processed pixel by the quadratic filter of FIG. 8 or the improved quadratic filter of FIG. 10. Thereafter, in step 717, the binarization part 140 compares a value of the accessed pixel with the threshold in accordance with Equation (11). If the brightness value of the accessed pixel is larger than or equal to the threshold ("Yes" path from decision step 717), the corresponding pixel is converted into a brightness value α for character pixels in step 721, and if the brightness value of the accessed pixel is smaller than the threshold ("No" path from decision step 717), the corresponding pixel is converted into a brightness value β for background pixels in step 719. Thereafter, the binarization part 140 determines in step 723 whether the binarization process is completed for all pixels of the corresponding character block. If the binarization process is not completed ("No" path from decision step 723), the binarization part 140 increases the pixel number PN by one in step 729, and then returns to step 715 to repeat the above binarization operation. Throughout this binarization process, all pixels of the character block are binarized into a brightness value α or a brightness value β. However, if it is determined in step 711 that the received block is a background block ("Yes" path from decision step 711), the binarization part 140 performs steps 731 to 739 in which all pixels of the background block are collectively converted into the brightness value β for background pixels.

Please amend page 43, lines 3-11, as follows:

Referring to FIG. 18, in step 611, the input part 110 receives an input image shown in FIG. 19A. FIGs. 19A-I are examples of images generated in each step of the binarization procedure of FIG. 18. It is assumed that the image consists of 640 (columns) × 480 (rows) pixels. In step 613, the block classification part 120 divides the input image [[of]] as represented by FIG. 19A received from the input part 110 into blocks, analyzes pixels of the divided blocks, and classifies the divided blocks into character blocks and background blocks. The input image is divided into 8×8-pixel blocks, and then classified into character blocks and background blocks shown in FIG. 19B. In FIG. 19B, which is an example of an input image, gray portions represent regions classified as character blocks, while black portions represent regions classified as background blocks.

Please amend page 45, lines 12-15, as follows:

Through repetition of the above operation, the character blocks and the background blocks are binarized, and if it is determined in step 637 that the binarization is completed for all bocks of the image, a binarized image [[of]] as represented by FIG. 19I is output in step 639 ("Yes" path from decision step 637).

Please amend page 45, lines 12-15, as follows:

FIG. 20 is a flowchart illustrating an example of a binarization method in which the edge enhancement part 130 is implemented using the improved quadratic filter in accordance with an embodiment of the present invention. FIG. 20 shows a binarization method according to the fourth embodiment in which the improved quadratic filter is used. FIGs. 21A to 21G are ~~diagrams~~ examples of images illustrating images generated when the binarization is performed in the procedure of FIG. 20.

Please amend page 45, line 24, through page 46, line 3, as follows:

Referring to FIG. 20, in step 611, the input part 110 receives an input image shown in FIG. 21A. It is assumed that the image consists of 640 (columns) × 480 (rows) pixels. In step 613, the block classification part 120 divides the input image [[of]] represented by FIG. 21A received from the input part 110 into blocks, analyzes pixels of the divided blocks, and classifies the divided blocks into character blocks and background blocks. The input image is divided into 8×8-pixel blocks, and then classified into character blocks and background blocks ~~shown~~ as represented in FIG. 21B. In FIG. 21B, gray portions represent regions classified as character blocks, while black portions represent regions classified as background blocks.

Please amend page 45, lines 5-17, as follows:

In step 615, the block growing part 160 extends the character blocks classified by the block classification part 120 as ~~shown~~ as represented in FIG. 21C. In the block classification process, a block containing character pixels can be incorrectly classified as a background block due to the influence of a background between character pixels. The block growing part 160 grows the character blocks in order to extend pixels in a character block incorrectly classified as a background block. Then, in step 617, the block growing part 160 sequentially outputs the grown character blocks [[of]] as represented in FIG. 21C to the block grouping part 170. The image output to the block grouping part 170 corresponds to the character blocks ~~shown~~ as represented in FIG. 21D. In step 619, the block grouping part 170 receives the character blocks [[of]] as represented in FIG. 21D output from the block growing part 160, and groups each of the character blocks with its 8 adjacent blocks, generating the grouped blocks [[of]] as represented by FIG. 21E.

Please amend page 46, line 19, through page 47, line 5, as follows:

The grouped block image [[of]] as represented by FIG. 21E is input into the edge enhancement part 130. The edge enhancement part 130 is the improved quadratic filter. In step 621, the improved quadratic filter calculates the first threshold value Th1 for classifying each pixel of the character block as a character or background pixel. The first threshold value Th1 can be calculated using Equation (4). In step 623, the mean computation part 313 classifies pixels of the character block into character and background pixels on the basis of the first threshold value Th1, and calculates mean brightness values for the character and background pixels for a character block, in accordance with Equation (5) and Equation (6). In step 625, the normalization part 315 normalizes the pixels of the character block $x(m,n)$ using the mean brightness value μ_0 for the character pixels and the mean brightness value μ_1 for the background pixels output from the mean computation part 313 so that the character pixels have values close to a '1' while the background pixels have values close to '0'. The normalization part 315 normalizes the pixels of the character block $x(m,n)$ in accordance with Equation (7).

Please amend page 47, lines 17-26, as follows:

In step 633, the block splitting part 180 receives the grouped block output from the quadratic filter, and separates the character block from the grouped block. The block splitting part 180 performs the function of separating only a character block located at the center of the grouped block from the grouped block. In step 635, the binarization part 140 compares pixels of the character block separated by the block splitting part 180 with the threshold BTH_N, and binarizes the pixels into character and background pixels having the first and second brightness values as ~~shown~~ as

<u>represented</u> in FIG. 21F. Pixels of the background block output from the block classification part 120 or the block growing part 160 are binarized into the second brightness value.